

STUDY ON THE GENUS *LAYAHIMA* NAVÁS
(NEUROPTERA: MYRMELEONTIDAE) FROM CHINA

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Abstract.—Four species of *Layahima* Navás, 1912 (Neuroptera: Myrmeleontidae) are known from China, *L. elegans* (Banks, 1937), *L. chiangi* Banks, 1941, *L. validum* (Yang, 1997), **n. comb.**, and ***L. yangii* Wan and Wang, n. sp.** *Asialeon* Yang, 1997 is a **new synonym** of *Layahima*. *Dendroleon melanocoris* Yang, 1999, and *Dendroleon tripunctatus* Yang, 1999, are **new synonyms** of *Layahima elegans*. A key is provided for separation of the four species, and each species is described and illustrated.

Key words: Neuroptera, Myrmeleontidae, *Layahima*, China

Layahima Navás, 1912, probably belongs to the tribe Dendroleontini (Stange 2004). There are four described species, all from the Oriental Region: *L. nebulosa* Navás, 1912, from India (Darjeeling), *L. zonatus* (Navás, 1923) from Vietnam (Nhagrang), *L. elegans* (Banks, 1937) from China (Taiwan), and *L. chiangi* Banks, 1941 from China (Yunnan). The genus is distinguished by the regularly forked costal crossveins of the forewing forming two rows of cells (biareolate) and usually the cells occupying one-third to two-thirds the length of the costal area. These characters are slightly similar to those found in *Platyleon* Esben-Petersen and *Epacanthaclisis* Okamoto. However, pilula axillaries of the male are absent in *Layahima*, while they are present in *Platyleon* and *Epacanthaclisis*.

MATERIALS AND METHODS

All figures are taken by a digital camera, modified and arranged in Adobe Photoshop 7.0®.

Type specimens are deposited in CAU (Insect Collection of China Agricultural University, Beijing, China). Other specimens examined are deposited in CAU and IZAS (Insect Collection of the Institute of Zoology, Chinese Academy of Sciences, Beijing, China).

TAXONOMY

Layahima Navás

Layahima Navás 1912: 36; Banks 1941: 1; Stange 1976: 309; Miller et al. 1999: 74.

Type species: *Layahima nebulosa* Navás, 1912, by original designation.

Noues Navás 1923: 13; Banks 1937: 285; Banks 1941: 3; Stange 1976: 309. Type species: *Noues zonatus* Navás, 1923, by monotypy.

Asialeon Yang 1997: 614. Type species: *Asialeon validum* Yang, 1997, by original designation. **New synonym.**

Diagnosis.—Antenna sturdy, with well-developed club. Vertex slightly raised. Forewing: Costal area often biareolate; bi-

furcation of Rs arises only a little before or opposite to cubital fork; anterior Banksian line often present; 2A connected to 3A at same point or a short crossvein; 2A and 3A often forked. Hind wing: Costal crossvein forked only near stigma; presectoral area with one crossvein. Legs: stout, spurs developed; the 5th tarsomere long as or longer than 1st–4th tarsomeres. Abdomen: Shorter than wing length, covered with long setae on ectoproct. Female: Lateral gonapophyses with long and thick digging setae; anterior gonapophyses absent, posterior gonapophyses large, broad, finger shaped; pregenital plate large, sclerotized; spermatheca often long and large; sternite VII with long thick hairs. Male: pilula axillaries absent; gonocarcus arcuate; mediuncus prominent; parameres plate shaped, not separate distinctly.

Comments.—Some characters of *Layahima* Navás accord with those of Dendroleontini, for example, “bifurcation of Rs arises only a little before or opposite to cubital fork,” “2A connected to 3A at same point or a short crossvein,” “2A connected to 3A at same point or a short crossvein.” However, other characters of *Layahima*, such as “legs stout, pilula axillaries of male absent and anterior gonapophyses of female absent” are peculiar to Dendroleontini. While most genera in Dendroleontini, such as *Dendroleon* Brauer, 1866, *Gatzara* Navás, 1915 and *Cymothales* Gerstaecker, 1893 have opposite character, i.e., “legs slender, pilula axillaries of male present and anterior gonapophyses of female present.” So it is uncertain about status of *Layahima*, Stange (1976) had treated *Layahima* as “a genus no status in Dendroleontini.” It has not been clear about the status of *Layahima* until now. The supposition is that *Layahima* might be an independent, valid tribe according to its “transitional” characters. The status of the presumed tribe should be located between Dendroleontini and Myrmecaelurini.

Chi-kun Yang published on the genus *Asialeon* in 1997. However, its genitalia and body characters are very similar to *layahi-*

ma. It is treated as a synonym of *Layahima* in this paper.

Distribution.—Oriental Region: China, Vietnam, India.

KEY TO SPECIES OF *LAYAHIMA* FROM CHINA

1. Spurs extending to apex of 4th tarsomere in foreleg and midleg, and to apex of 3rd tarsomere in hind leg (Fig. 25) *yangii*, n. sp.
- Spurs extending to apex of 3rd tarsomere in foreleg and midleg, and to apex of 2nd tarsomere in hind leg (Figs. 4, 11, 18) 2
2. Pronotum longer than wide (Figs. 3, 17, 24); parameres of male long and narrow (length \geq 0.35 mm; width \leq 0.10 mm) 3
- Pronotum wider than long (Fig. 10); parameres of male short and wide (length $<$ 0.33 mm, width \geq 0.17 mm) (Fig. 14) *chiangi*
3. Pronotum with distinct longitudinal stripes (Fig. 3), gonarcus of male gently curved (Fig. 7) *elegans*
- Pronotum without longitudinal stripes (Fig. 17), gonarcus of male strongly curved (Fig. 28) *validum*

Layahima elegans (Banks)

(Figs. 1–7)

Noues elegans Banks 1937: 285.

Layahima elegans: Stange 1976: 310.

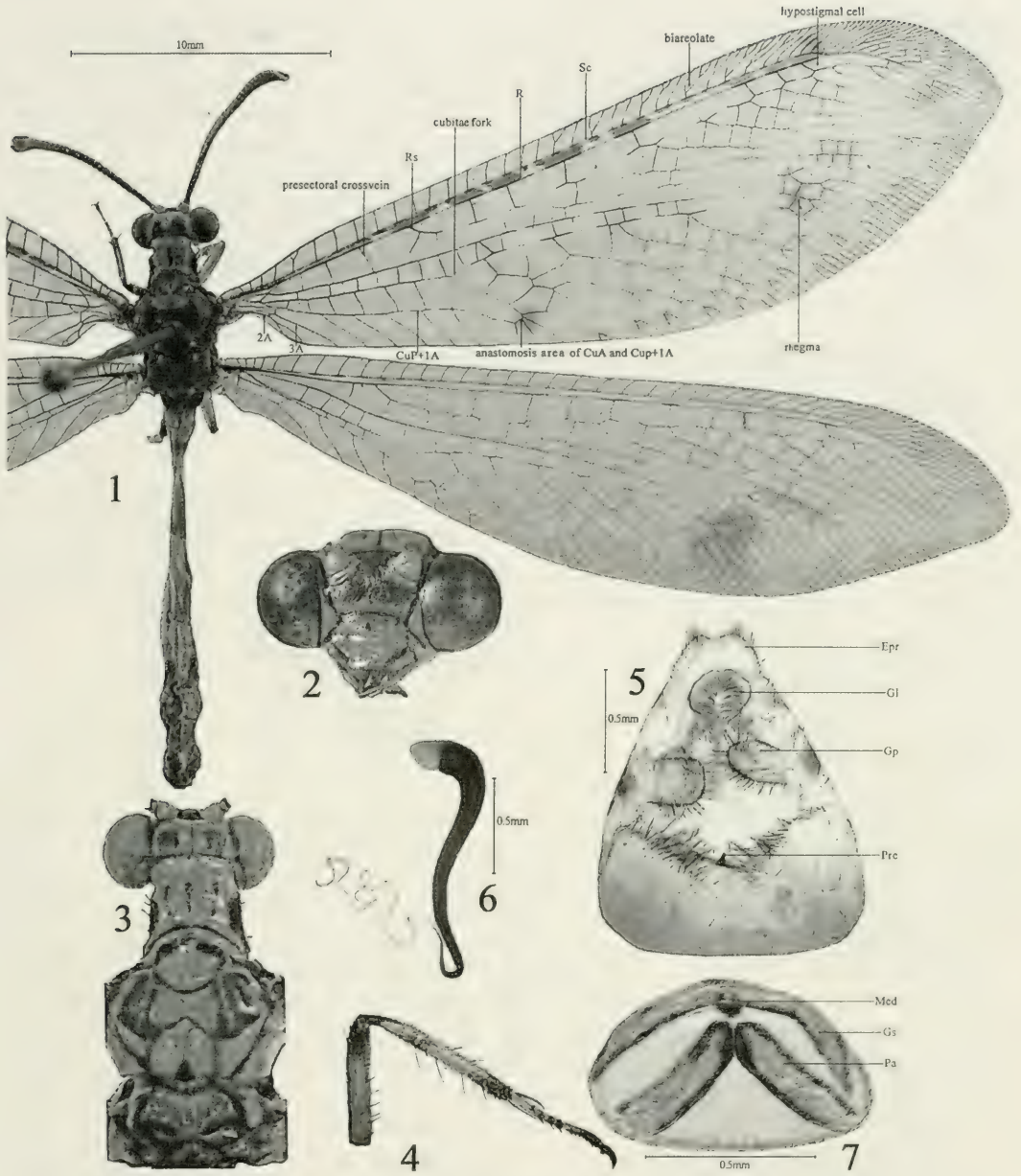
Dendroleon melanocoris Yang 1999: 616.

New synonym.

Dendroleon tripuntatus Yang 2002: 297.

New synonym.

Male.—Length, forewing 31–32 mm; hind wing 30–31 mm; abdomen 15–17 mm (Fig. 1). *Head*: Eyes black grayish with black small spot; face yellow brown with long brown hairs; black frons convex; vertex raised with a pair of round black spots and short black setae; clypeus and labrum pale brown; maxillary and labial palpi yellow brown (Fig. 2); antenna stout, brown to black, scape and pedicel yellow, flagellum with about 34 flagellomeres. *Thorax*: Pronotum slightly longer than wide, yellow with sparse black curved setae; a pair of round spots near anterior margin; median stripe linear, black, a longitudinal black-brown stripe on each side (in one specimen distinct); posterior part of lateral margins black; meso- and metanota mainly yellow



Figs. 1-7. *Layahima elegans*. 1, Male. 2, Head, frontal view. 3, Head and thorax, dorsal view. 4, Hind leg. 5, Apex of femal abdomen. 6, Spermatheca. 7, Male genitalia, caudal view. Abbreviations: Epr = ectoproct; G1 = lateral gonapophyses; Gp = posterior gonapophyses; Pre = pregenitale; Med = mediuncus; Gs = gonacarcus; Pa = paramere.

brown, mesoprescutum yellow with black stripe on each side, mesoscutum with one irregular black lateral stripe, mesoscutellum with a small median black triangular spot (Fig. 3). *Legs*: Yellow to brown; femur and

tibia of all legs with short black setae and sparse black setae; foreleg: coxa with sparse black hairs; distal and lateral parts of femur and tibia black; femur sense hair long but shorter than length of femur; 5th tarsomere

black distally and pale basally, 1st–4th tarsomeres pale; spurs, claw red brown; spurs extending to apex of 2nd tarsomere, midleg and hind leg similar to foreleg, but hind femur without sense hair, spurs extending to apex of 2nd tarsomere (Fig. 4). *Forewing*: Pale brown, all longitudinal veins white with brown streaks, most crossveins white; costal crossveins forked, occupying one-third to half length of costal area; 9 long and 3–4 short black stripes between R and Rs; width of costal area as wide as width between R and Rs; Banksian lines developed; Rs with about 9 branches; presectoral area with 3–5 crossveins; bifurcation of Rs slightly before cubitae fork; anastomosis area of CuA and CuP+1A and rhegma area with distinct irregular brown stripe (sometimes indistinct); 2A connected to 3A at one point, 3A forked; stigma white, brown at base. *Hind wing*: Shorter, narrower, and paler than forewing; width between R and Rs wider than width of costal area; stripes between R and Rs pale; presectoral area with one crossvein; anastomosis area of CuA and CuP+1A without spot; rhegma area with larger irregular brown stripe. *Abdomen*: Yellow brown to black brown with short black hairs, each tergite mainly yellow, black brown anteriorly; sternite IX pentagonal; genitalia as in Fig. 7.

Female.—Similar to male, abdominal color darker than male. Female terminalia: lateral gonapophyses halfmoon shaped with thick digging setae; posterior gonapophyses finger shaped, broad and flat with slender and brushy black hairs (Fig. 5); spermatheca as in Fig. 6.

Distribution examined.—China (Taiwan, Fujian, Guangxi, Hubei, Sichuan, Guizhou, Hainan).

Material examined.—1 ♂, Guangxi Province: Jinxiu County, Luoxiang, 15-V-1999, 400 m, Wenzhu Li leg.; 1 ♂, holotype of "*Dendroleon melanocoris* Yang 1999," Fujian Province, Lianjiang County, Taipingliao, 9-VI-1988, Wei Chen leg.; 1 ♂, holotype of "*Dendroleon tripunctatus* Yang 2002," Hainan Province, Mt. Wuzhishan,

29-IV-1983, Maobing Gu leg.; 1 ♂, Sichuan Province: Mt. Emeishan, 800–1,000 m, 25-VI-1957, Fuxing Zhu leg.; 1 ♀, allotype of "*Dendroleon melanocoris* Yang 1999", Hubei Province: Badong County, 130 m, 26-VI-1993, Hongxing Li leg.; 2 ♂, Guizhou Province, Ceheng County, 800 m, collector unknown.

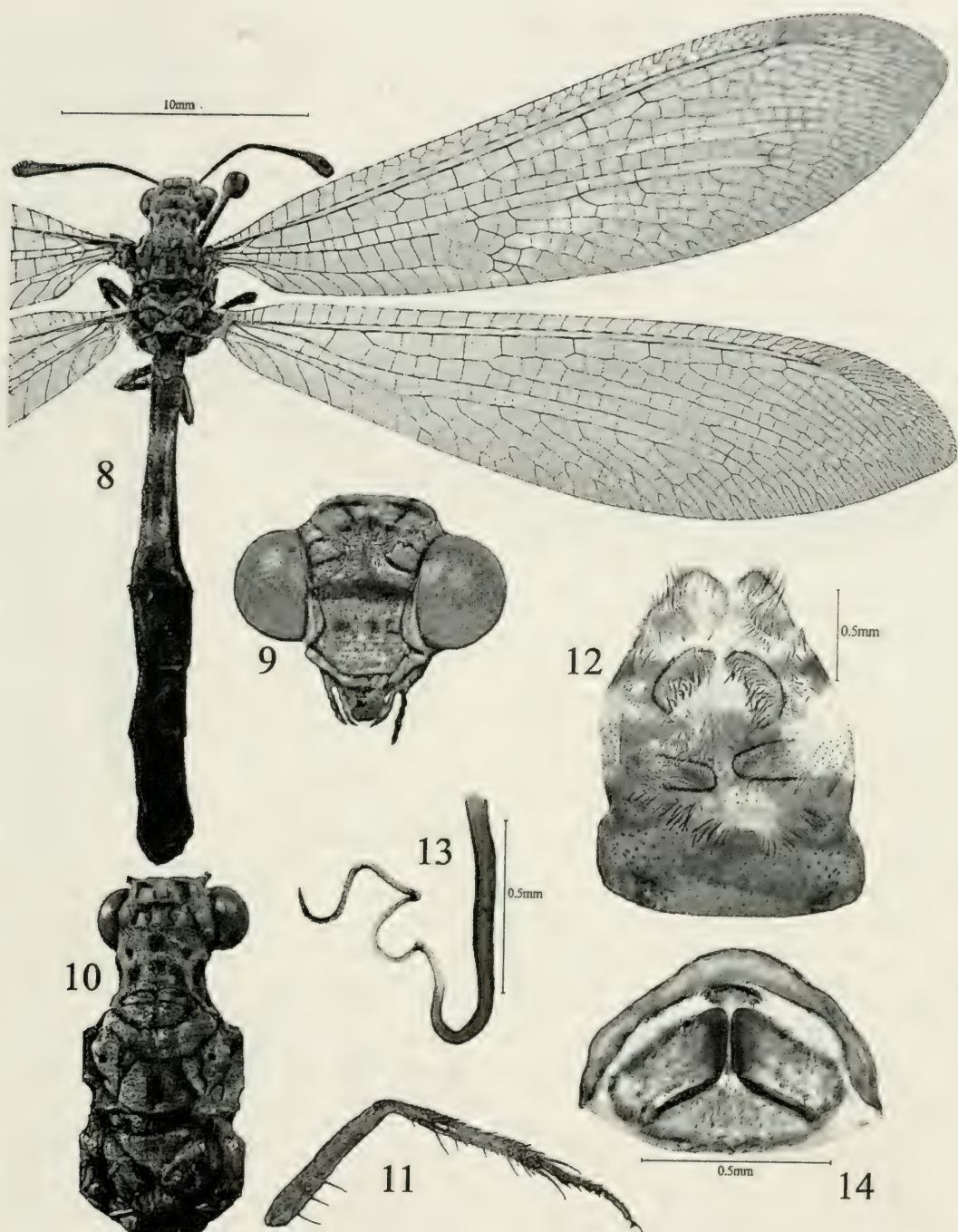
Comments.—The wing spots are slightly different among the seven examined specimens. Four specimens (one from Fujian Province; two from Guizhou Province; one from Hubei Province) have distinct spots on the rhegma area of the wings; one specimen (from Hainan Province) has indistinct spots on the rhegma area; those of two specimens (from Sichuan and Guangxi Province) are moderate. However, the spot pattern of the head, thorax, and legs and male genitalia are similar in all specimens.

Layahima chiangi Banks

(Figs. 8–14)

Layahima chiangi Banks 1941: 1; Stange 1976: 310.

Male.—Length, forewing 30–32 mm; hind wing 29–31 mm; abdomen 19–21 mm (Fig. 8). *Head*: Eyes gray with small black spot; face black brown with sparse brown hairs; black frons convex; vertex raised with a pair of triangular brown spots; clypeus and labrum pale brown; maxillary and labial palpi yellow brown (Fig. 9); antenna stout, black brown, scape and pedicel yellow, flagellum with 34 flagellomeres. *Thorax*: Pronotum wider slightly than long, brown with sparse white curved and short black setae, two median spots black, one round spot and one longitudinal black spot on each side; posterior part of lateral margins black; meso- and metanota mainly dim brown with many small black dots; mesoprescutum with "L-shaped" black stripe on each side, mesoscutum with one round black small spot near wing bases and one large elliptical black spot near anterior part of mesoscutellum; mesoscutellum with a median black stripe; mainly black brown,



Figs. 8-14. *Layahima chiangi*. 8, Male. 9, Head, frontal view. 10, Head and thorax, dorsal view. 11, Hind leg. 12, Apex of female abdomen. 13, Spermatheca. 14, Male genitalia, caudal view.

metascutum and metascutellum brown without distinct spots (Fig. 10). *Legs*: Mainly brown, femur and tibia of all legs with thick white sparse black setae; foreleg: coxa pale with thick white hairs and a brown median spot; femur pale brown with a short sense hair at base; tibia yellow brown, basal and apical part black brown; 1st tarsomere pale and 2nd-5th tarsomeres dim brown; spurs, claw red brown; spurs curved strongly, extending to apex of 3rd tarsomere; midleg and hind leg similar to foreleg, but hind femur without sense hair, spurs extending to apex of 2nd tarsomere (Fig. 11). *Forewing*: Brown, all longitudinal veins white with brown streaks, most crossveins yellow brown; costal crossveins forked, occupying two-thirds length of costal area; width of costal area slight wider than width between R and Rs; Rs with about 9 branches; presectoral area with 4-6 crossveins, 2-4 irregular cells; bifurcation of Rs slightly before cubitae fork; anastomosis area of CuA and CuP+1A and rhagma area with indistinct irregular brown stripe; Banksian lines undeveloped; 2A connected to 3A at one point or a short crossvein, all 2A and 3A forked; stigma white with brown spot at base. *Hind wing*: Shorter, narrower, and paler than forewing; width between R and Rs wider than that of costal area; presectoral area with one crossvein; anastomosis area of CuA and CuP+1A and rhagma area without stripe. *Abdomen*: Brown to black brown, with short black hairs, each tergite mainly yellow; sternite IX curved, thin finger shaped; ectoproct with long thick hairs; genitalia as in Fig. 14.

Female.—Similar to male, body color darker than male. Female terminalia: lateral gonapophyses bent with thick digging setae; posterior gonapophyses finger shaped, median stout with thin and brushy brown hairs (Fig. 12); spermatheca as in Fig. 13.

Distribution.—China (Yunnan, Tibet). *Material examined*.—2 ♀, 1 ma, Tibet, Mangkang County, Yanjing, 2,600 m, 17-VI-1976, Yinghen Han leg; 1 ♀, Yunnan

Province, Deqing County, Xiaruo, 2,070 m, 16-V-1979, Xiangqun Yan leg; 1 ♂, Yunnan Province, Deqing County, Snow Mt. Meili, 3,810 m, 22-VII-1982, Shuyong Wang leg.

Comments.—The most important character of this species is the short and broad parameres (Fig. 14) of the male.

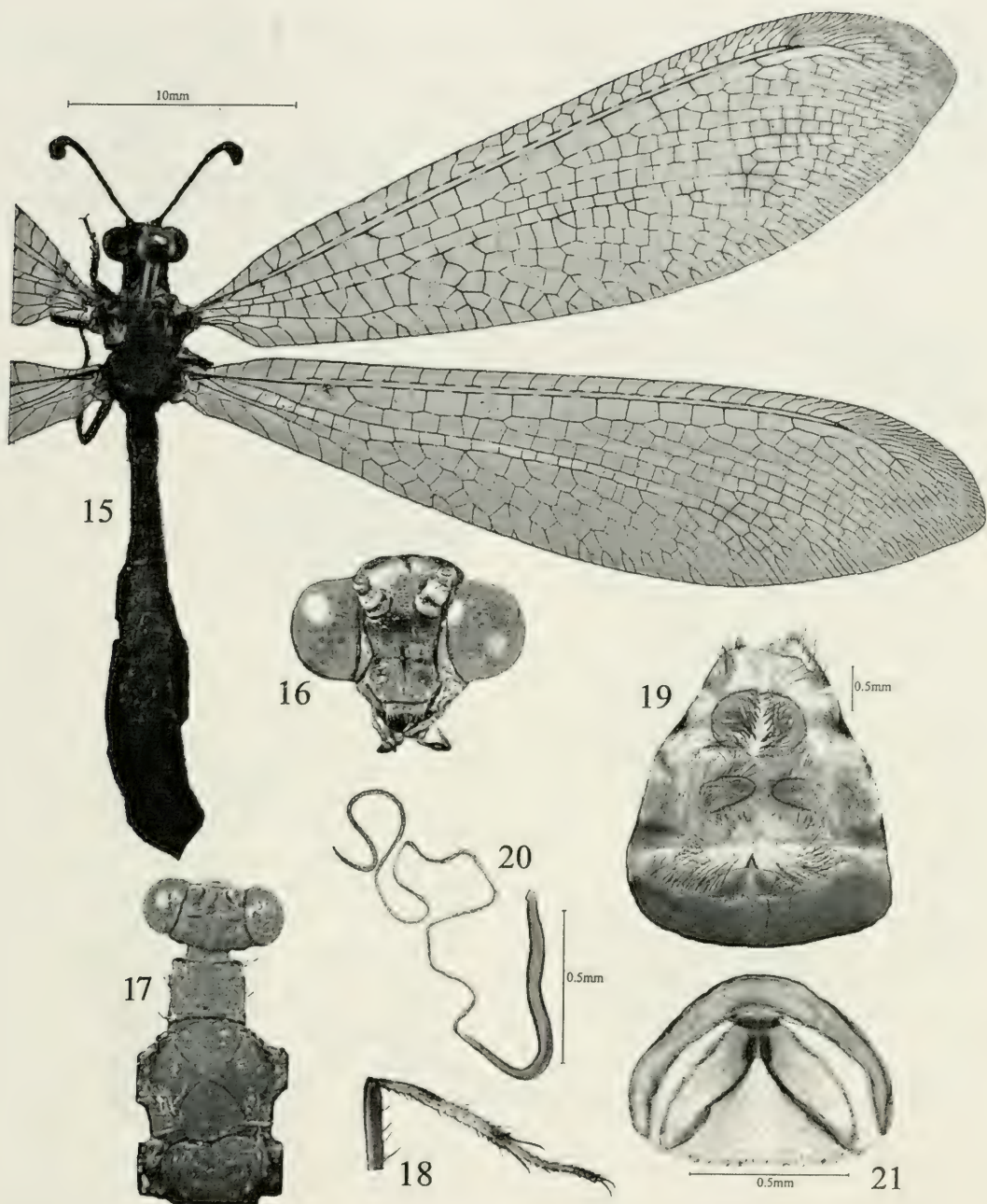
Layahima validum (Yang),

new combination

(Figs. 15–21)

Asialeon validum Yang 1997: 614–615.

Female.—Length, forewing 34–35 mm; hind wing 33–34 mm; abdomen 18–20 mm (Fig. 15). *Head*: Eye black with small black spot; face black brown with brown hairs; black frons convex; vertex raised black with short white setae; clypeus and labrum pale brown; maxillary and labial palpi yellow brown basally, black brown apically (Fig. 16); antenna stout with short black hairs, scape yellow with narrow ring basally, pedicel black basally and brown apically, flagellum with about 34 flagellomeres, each flagellomeres black basally and yellow brown apically. *Thorax*: Pronotum longer slightly than wide, black with sparse short black and long curved white setae; a pair of gray transverse spots near anterior margin; median part black, with a gray half-moon shaped spot on each side; median part of lateral margins with a gray small spot; meso- and metanota mainly black with sparse white setae; mesoprescutum and mesoscutum with a pair of small gray spots, respectively (Fig. 17). *Legs*: Black brown; femur and tibia of all legs with thick black and white setae; foreleg: coxa with brushy white hairs; femur black brown, tibia yellow with black streaks; femur sense hair long but shorter than the length of femur; 1st, 2nd, and basal part of 5th tarsomere pale yellow, 3rd, 4th, and distal part of 5th tarsomere black brown; spurs, claw red brown; spurs bent, extending slightly past apex of 3rd tarsomere; midleg and hind leg similar to foreleg, but hind femur without sense



Figs. 15–21. *Layahima validum*. 15, Female. 16, Head frontal view. 17, Head and thorax, dorsal view. 18, Hind leg. 19, Apex of female abdomen. 20, Spermatheca. 21, Male genitalia, caudal view.

hair, spurs extending to apex of 2nd tarsomere (Fig. 18). *Forewing*: Black with indistinct spot, all longitudinal veins black with pale streaks, most crossveins black; costal crossveins forked, occupying two-

thirds length of costal area; width of costal area as broad as width between R and Rs; Rs with about 10 branches; presectoral area with 5 crossveins, one or two irregular cells occasionally; bifurcation of Rs slightly be-

fore cubitae fork; anastomosis area of CuA and CuP+1A and rhexma area with indistinct irregular brown stripe; Banksian lines developed; 2A connected to 3A at one point or a short crossvein, all 2A and 3A forked; stigma white with brown spot at base. *Hind wing*: Shorter, narrower, and paler than forewing; width between R and Rs wider than width of costal are; presectoral area with one crossvein; anastomosis area of CuA and CuP+1A without stripe; rhexma area with indistinct brown spot. *Abdomen*: Black with short brushy white hairs. *Female terminalia*: Lateral gonapophyses bent with thick digging setae; posterior gonapophyses finger shaped, median stout with long and thin brushy hairs (Fig. 19); spermatheca as in Fig. 20.

Male.—Similar to female; ectoproct oval with brushy black hairs, sternite IX pentagonal; genitalia as in Fig. 21.

Distribution.—China (Guangxi, Hubei).

Material examined.—♀, holotype, Hubei Province, Mt. Shennongjia, 960 m, 28-VII-1980, Chikun Yang leg.; 2 ♀, paratypes, Hubei Province, Xingshan County, longmenhe, 1,350 m, 18-VII-1993, Shimei Song leg.; 1 ♀, Guangxi Province, Longzhou County, Mt. Daqingshan, 360 m, 22-IV-1963, Chunguang Wang leg.; 1 ♂, Guangxi Province, Ningming County, Longrui, 180 m, 25-VI-1984, Fasheng Li leg.

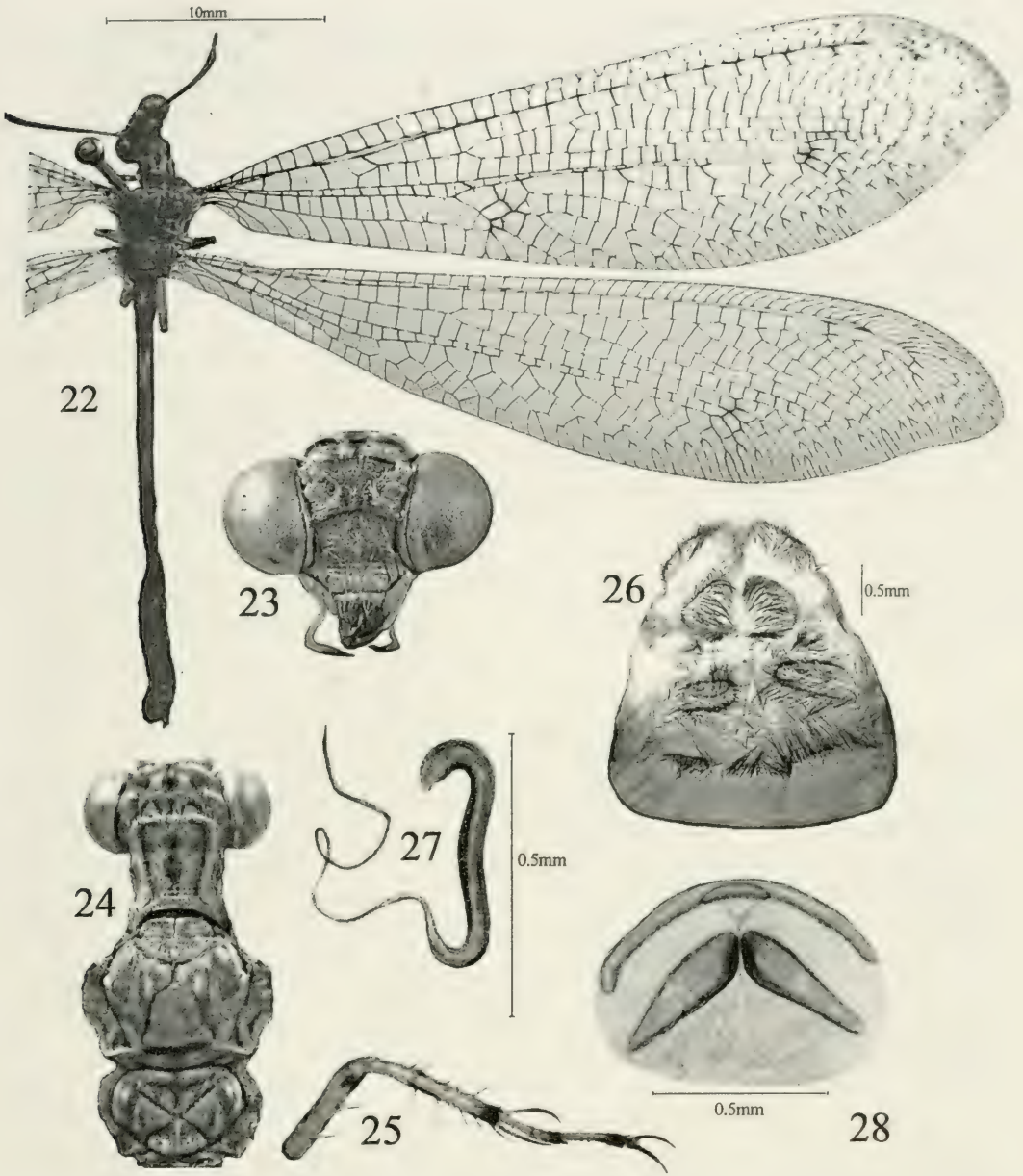
Comments.—The body color of this species is black, which is unique among all known species of the genus. Also, its parameres are longest (= 0.52 mm) among the four species, the lengths of the other species are as follows: 0.43mm (*L. eleans*), 0.42mm (*L. yangi*), 0.33mm (*L. chiangi*).

***Layahima yangi* Wan and Wang,
new species**

(Figs. 22–28)

Female.—Length, forewing 35–36 mm; hind wing 34–35 mm; abdomen 18–20 mm (Fig. 22). *Head*: Eyes green with small black spot; face black brown with sparse hairs; black frons convex; vertex raised, yellow with three pairs of brown spots;

clypeus and labrum black brown; maxillary and labial palpi yellow brown basally, black brown apically (Fig. 23); antenna stout yellow brown, scape and pedicel pale yellow with median spot, flagellum with about 34 flagellomeres. *Thorax*: Pronotum longer than wide, yellow with sparse short black and long curved white setae; median stripe brown, broad anteriorly and narrow posteriorly, with a “3-shaped” brown stripe on each side; median part of lateral margins black; meso- and metanota mainly yellow brown with sparse white setae; mesoprescutum with a pair of black “L-shaped” stripes, mesoscutum with two pairs of black longitudinal stripes on each side; mesoscutellum mainly black, metascutum and metascutellum black with indistinct pale spots (Fig. 24). *Legs*: Mainly yellow, femur and tibia of all legs with sparse white and black setae; foreleg: coxa with sparse white hairs and a brown median spot; distal part of femur, and middle and distal part of tibia black brown; femur sense hair as long as length of femur; 1st, 2nd, 3rd, and basal part of 5th tarsomere pale, 4th tarsomere and distal part of the 5th tarsomere black brown; spurs, claw pale brown; spurs curved strongly, extending to apex of 4th tarsomere; midleg and hindleg similar to foreleg, but hind femur without sense hair, spurs extending to apex of 3rd tarsomere (Fig. 25). *Forewing*: Pale with indistinct spot, all longitudinal veins white with black brown streaks, most crossveins pale yellow, costal crossveins forked, occupying half length of costal area; width of costal area slightly broader than width between R and Rs; Rs with 9 branches; presectoral area with 4-5 crossveins, sometimes 2-3 irregular cells; bifurcation of Rs much before cubitae fork; anastomosis area of CuA and CuP+1A and rhexma area with indistinct irregular brown stripe; Banksian lines developed; 2A connected to 3A at one point or with a short crossvein, 3A forked; stigma white with brown spot at base. *Hind wing*: Shorter, narrower, and paler than forewing; width between R and Rs slightly broader than



Figs. 22–28. *Layahina yangi*. 22, Female. 23, Head frontal view. 24, Head and thorax, dorsal view. 25, Hind leg. 26, Apex of female abdomen. 27, Spermatheca. 28, Male genitalia, caudal view.

width of costal area; presectoral area with one crossvein; anastomosis area of CuA and CuP+1A without stripe, rhexma area with indistinct brown spot. *Abdomen*: Mainly brown with short brushy brown hairs, all tergites yellow medially except tergite II. *Female terminalia*: Lateral gon-

apophyses bent with thick and digging setae; posterior gonapophyses finger shaped, median stout with long and thin brushy hairs (Fig. 26); spermatheca as in Fig. 27.

Male.—Similar to female; ectoproct triangular with long bushy hairs; sternite IX pentagonal; genitalia as in Fig. 28.

Distribution.—China (Guangxi).

Etymology.—The species is named in honor of Professor Yang Chikun. In the past twenty years, he has been done much constructive work on the taxonomy of Neuroptera from China.

Material examined.—Holotype, ♀, Guangxi Province, Pingxiang County, 16-V-1963, Chikun Yang leg. Paratypes, 1 ♂, Guangxi Province, Longzhou County, Nonggang, 20-V-1982, Fasheng Li leg.; 1 ♀, Guangxi Province, Ningming County, Longrui, 180 m, 17-VI-1984, Fasheng Li leg.; 1 ♀, Guangxi Province, Napo County, Defu, 1,350 m, 18-VI-2000, Jun Chen leg.

Comments.—The new species has the longest and bent spurs of any species, which extend to the apex of the 4th tarsomere in the foreleg and midleg, and to the apex of the 3rd tarsomere in the hind leg.

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